

Diversity of Bee Flora and Preparation of Floral Calendar for Scientific Beekeeping by Apiarist in Northern Hills Zone of Chhattisgarh, India

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ABSTRACT: The availability of nectar and pollen for the consumption of bees is mandatory in apiculture. Floral Calendar of a locality guides the beekeepers of *Apis cerena indica* for efficient bee management to derive maximum benefit from beekeeping. A study was conducted in Surguja, Surajpur and Balrampur districts of Northern Hills Zone of Chhattisgarh during the year 2021 and 2022. Relevant information was gathered from beekeepers through pre - structured schedule. Total 21 plant species such as Mustard, Sunflower, Tomato, Brinjal, Mango, Cucumber, Chilli, Guava, Litchi, Pigeon pea, Tamarind, Citrus, Neem, Maize, Ber, Marigold, Sesame, Bitter gourd, Sponge Gourd, Okra and Karanj were recognized as major honey bee forage sources. Study has showed that region is endowed with varied different flora hence, there is a great potential in the area for apiculture.

Keywords: Apiculture, *Apis cerena indica*, Bee flora, Floral calendar, Northern Hills Zone of Chhattisgarh.

INTRODUCTION

India is one of the leading mega biodiversity countries of the world to have more than 750 species of bee flora. It is estimated that majority of the floral resources of India is still under or unutilized. Pollination is a “free ecological service” which plays a vital role in the ecosystem by providing services to crops and wild plants. Pollination is a key part of global diversity. However in recent days, we found decline in both domesticated and wild pollinators due to environmental pollution, fragmentation of land, increased pest and disease, genetic diversity and variation in environmental conditions like rainfall, relative humidity and temperature. Pollinator decline impacting on two broad groups of flowering plants viz. crop plants and flowering plants. The plants which require obligate cross pollination by external agents, decline parallel with respective pollinator group (Potts *et al.*, 2010). ‘The existing bee flora in the country can very well support to 150-200 million colonies of bees but presently there are barely one million colonies tapping nectar from 0.5-0.7 per cent of the available bee floras. Bees depend solely upon the flowering plants to fulfill their dietary requirements and in turn render pollination of the plants. The plants that yield nectar and pollen are collectively referred as bee flora or bee pastures (Abrol, 1997). Honey bees perform a special service by pollinating several plant species. But the performance of honey bees depends on the over-all health of the colony which directly depends on the availability of bee flora in a region (Pande and Ramkrushna 2018). Honey

bees require pollen essentially for their brood rearing. Bee pasturage is a prime factor in successful beekeeping. India with great diversity of climate and geographic location, supports varied types of vegetations and cultivated crops. Even then, any locality chosen for beekeeping is not free from floral dearth. Through a systematic programme of afforestation, it is possible to develop continuous bee pasturage by judicious selection of bee friendly plant species. Bee pasturage development programmes may be undertaken with any non-government or government programmes like Integrated Rural Development Programme (IRDP) or National Rural Employment Guarantee Programme (NREGP)’. This will lead to continuous availability of nectar and pollen for successful beekeeping in addition to the aesthetic value, healthy environment and overall economic return to the people of the locality. Floral Calendar of a locality guides the beekeeper for efficient bee management to derive maximum benefit from beekeeping.

MATERIALS AND METHODS

The study was conducted at Surguja, Surajpur and Balrampur districts of Northern Hills Zone of Chhattisgarh state during year 2021-2022. Fifty beekeepers were selected randomly from each of the selected district, thus in total 150 beekeepers were incorporated as respondents for in-depth study. The data were collected through personal interview with the help of pre-tested interview schedule from all beekeepers. Information on bee flora, their flowering

time and contribution per cent in every month were collected from respondents during the study period.

Availability of bee flora per month = Number of bee flora species in a month / Total number of bee flora*100

RESULTS AND DISCUSSION

A. Honey bee flora

Vegetation characteristics of the study areas are considered to be an important indicator for the potentialities of the area for beekeeping. Survey conducted in the study area showed that the cultivated and natural honey flora potential of the area makes it very favorable for beekeeping.

The data of be flora with respect to their common name, scientific name, family, habit and forage collected by bees were presented in Table 1. According to the beekeepers 21 plant species namely Mustard, Sunflower, Tomato, Brinjal, Mango, Cucumber, Chilli, Guava, Litchi, Pigeon pea, Tamarind, Citrus, Neem, Maize, Ber, Marigold, Sesame, Bitter gourd, Sponge Gourd, Okra and Karanj were recognized as major honeybee forage source. Bee (*Apis cerena indica*) visited plants for its food, nectar and pollen. The

vegetation type of honey bee flower species includes tree, shrubs, herbs and creepers. The identified honey bee flora produces both pollen and nectar.

These results are similar with Gidey *et al.* (2012) who reported that majority (58.4%) of the beekeepers were growing different indigenous bee forage. Also, findings are in line with Adhikari and Ranabhat (2011) who concluded that plants were categorized as major, medium and minor sources of pollen and/or nectar. Also, findings are in line with Ara *et al.* (2019); Behera *et al.* (2014); Ghode and Kumar (2022); Jaswal *et al.* (2022); Kumar *et al.* (2021); Paikara and Painkra (2021); Painkra, (2020); Painkra and Jaiswal (2022); Painkra *et al.* (2021); Pandey *et al.* (2022); Sivaram (2001); Yadav, *et al.* (2021); Vidya *et al.* (2020) who reported that the activity of honeybees depends on the bee flora availability and quantity and quality of nectar, pollen present in them. In the present study were surveyed to assess the diversity of bees' flora from July 2019- March 2020 which is covered with Agro-horticultural crops, wild plants and trees. Total 93 plants were considered as a bee flora.

Table 1: Bee flora recorded at Northern Hills Zone of Chhattisgarh.

Sr. No	Name of flora	Scientific name	Habit	Forage collection by honey bees
1.	Mustard	<i>Brassica compestris</i>	Herb	N + P
2.	Sunflower	<i>Helianthus annus</i>	Herb	N + P
3.	Tomato	<i>Lycopersican esculentum</i>	Herb	N
4.	Brinjal	<i>Solenum melongena</i>	Herb	N + P
5.	Mango	<i>Mangifera indica</i>	Tree	N
6.	Cucumber	<i>Cucumis sativus</i>	Creeper	N + P
7.	Chilli	<i>Capsicum frutescens</i>	Herb	N + P
8.	Guava	<i>Psidium guajava</i>	Tree	N + P
9.	Litchi	<i>Litchi chinensis</i>	Tree	N + P
10.	Pigeon pea	<i>Cajanus cajan</i>	Shrub	N + P
11.	Tamarind	<i>Tamarindus indica</i>	Tree	N + P
12.	Citrus	<i>Citrus limon</i>	Shrub	N + P
13.	Neem	<i>Azadirachta indica</i>	Tree	N + P
14.	Maize	<i>Zea mays</i>	Herb	P
15.	Ber	<i>Ziziphus mauritiana</i>	Tree	N + P
16.	Marigold	<i>Tagetes erecta</i>	Shrub	P
17.	Sesame	<i>Sesamum indicum</i>	Herb	N + P
18.	Bitter gourd	<i>Momordica charantia</i>	Climber	N + P
19.	Sponge gourd	<i>Luffaegyptiaca</i>	Climber	N + P
20.	Okra	<i>Abelmoschus esculentus</i>	Herb	N + P
21.	Karanj	<i>Millettia pinnata</i>	Tree	N + P

N=Nectar; P=Pollen

B. Bee flora availability

Table 2 depicts floral abundance round the year. Richness of plant species and colorful flower attracted the honey bee towards them. Among the diverse flora, horticulture crop were predominant nutritional resource.

The highest floral abundance was recorded during the month of September, followed by January and August). December, February, March, April and may had moderate floral abundance. October, November, June and July were recorded with less floral abundance.

Table 2: Bee flora availability in field crops, horticulture crops, ornamental plants and trees.

Sr. No.	Month	Total bee flora	Floral availability (%)			
			FC	HC	OP	T
1.	June	4	25.00	25.00	0.00	50.00
2.	July	4	25.00	50.00	0.00	25.00
3.	August	8	12.5	87.5	0.00	0.00
4.	September	10	20.00	70.00	0.00	10.00
5.	October	7	14.28	71.42	0.00	14.28
6.	November	5	40.00	20.00	20.00	20.00
7.	December	7	57.15	14.28	14.28	14.28
8.	January	9	44.45	33.33	11.11	11.11
9.	February	7	14.28	42.87	14.28	28.57
10.	March	7	14.28	28.58	0.00	57.14
11.	April	8	25.00	25.00	0.00	50.00
12.	May	8	25.00	25.00	0.00	50.00

FC=Field crop; HC=Horticulture crop; OP=Ornamental plant; T=Tree, %=Percentage



CONCLUSIONS

Result revealed that 21 bee flora were useful to honey bees in different month of calendar year, at Surguja, Surajpur and Balrampur districts of Northern Hills Zone of Chhattisgarh. Bee flora was further classified as pollen and nectar on the basis of secondary data available. The bees are necessarily important component in cropping system by pollinating wide variety of crops. These groups were the provider of pollen, nectar and both pollen and nectar. It can be concluded that Northern Hills Zone of Chhattisgarh can be considered as rich bee floral area, where scientific beekeeping should be undertaken to improve the farmers livelihood. The record of wild bee flora during the study encourages their conservation for sustainable bee keeping in future as well.

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Conflict of Interest. None.

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